CLAIMS

What is claimed is:

1. An article having a platinum-aluminide surface region, comprising:

a substrate having a nickel-base alloy substrate bulk composition and a substrate surface; and

a surface region at the substrate surface, the surface region having an integrated aluminum content of from about 18 to about 24 percent by weight and an integrated platinum content of from about 18 to about 45 percent by weight, balance components of the substrate bulk composition, totalling 100 percent by weight.

2. The article of claim 1, wherein the integrated aluminum content of the surface region is from about 21 to about 23 percent by weight and the integrated platinum content of the surface region is from about 30 to about 45 percent by weight.

3. The article of claim 1, wherein the article further includes a ceramic layer overlying the surface region.

4. The article of claim 1, wherein the thickness of the surface region is from about 0.0015 to about 0.004 inches.

5. The article of claim 1, wherein the substrate is selected from the group consisting of a turbine blade and a turbine vane.

6. The article of claim 1, wherein the nickel-base alloy substrate is substantially a single crystal and the substrate bulk composition includes from about 5 to about 16 weight percent aluminum and from about 1 to about 8 weight percent rhenium.

7. The article of claim 1, wherein the nickel-base alloy substrate is substantially a single crystal and the substrate bulk composition is selected from the group consisting of (a) 7.5 percent cobalt, 7 percent chromium, 6.2 percent aluminum, 6.5 percent tantalum, 5 percent tungsten, 1.5 percent molybdenum, 3 percent rhenium, balance nickel; (b) 12.5 percent cobalt, 4.5 percent chromium, 6 percent aluminum, 7.5 percent tantalum, 5.8 percent tungsten, 1.1 percent molybdenum, 5.4 percent rhenium, 0.15 percent hafnium, balance nickel; and (c) 12 percent cobalt, 6.8 percent chromium, 6.2 percent aluminum, 6.4 percent tantalum, 4.9 percent tungsten, 1.5 percent molybdenum, 2.8 percent rhenium, 1.5 percent hafnium, balance nickel.

8. A method for preparing an article having a platinum-aluminide surface region, comprising the steps of:

providing a substrate having a nickel-base alloy substrate bulk composition and a substrate surface;

depositing a layer of platinum upon the substrate surface;

diffusing platinum from the layer of platinum into the substrate surface;

providing a source of aluminum; and

diffusing aluminum from the source of aluminum into the substrate surface for a time sufficient to produce a surface region at the substrate surface, the surface region having an integrated aluminum content of from about 18 to about 24 percent by weight and an integrated platinum content of from about 18 to about 45 percent by weight, balance components of the substrate bulk composition.

9. The method of claim 8, including an additional step, after the step of diffusing aluminum, of

depositing a ceramic layer overlying the substrate surface.

10. The method of claim 8, including an additional step, after the step of diffusing aluminum, of

annealing the substrate and the surface region.

11. The method of claim 8, wherein the step of diffusing aluminum includes the step of

diffusing aluminum from the source of aluminum into the substrate surface for a time sufficient that the surface region has an integrated aluminum content of from about 21 to about 23 percent by weight and an integrated platinum content of from about 30 to about 45 percent by weight, balance components of the substrate bulk composition.

12. The method of claim 8, wherein the step of providing a substrate includes the step of

providing a nickel-base alloy substrate which is substantially a single crystal and has a composition that includes from about 5 to about 16 weight percent aluminum and from about 1 to about 8 weight percent rhenium.

13. The method of claim 8, wherein the step of providing a substrate includes the step of

providing a nickel-base alloy substrate which is substantially a single crystal and has a composition selected from the group consisting of (a) 7.5 percent cobalt, 7 percent chromium, 6.2 percent aluminum, 6.5 percent tantalum, 5 percent tungsten, 1.5 percent molybdenum, 3 percent rhenium, balance nickel; (b) 12.5 percent cobalt, 4.5 percent chromium, 6 percent aluminum, 7.5 percent tantalum, 5.8 percent tungsten, 1.1 percent molybdenum, 5.4 percent rhenium, 0.15 percent hafnium, balance nickel; and (c) 12 percent cobalt, 6.8 percent chromium, 6.2 percent aluminum, 6.4 percent tantalum, 4.9 percent tungsten, 1.5 percent molybdenum, 2.8 percent rhenium, 1.5 percent hafnium, balance nickel.

14. An article prepared by the method of claim 8.

15. An article prepared by the method of claim 9.

16. A method for preparing an article having a platinum-aluminide surface

region, comprising the steps of:

providing a substrate having a nickel-base alloy substrate bulk composition and a substrate surface;

depositing a layer of platinum about 0.0003 inches thick upon the substrate surface;

heating the substrate and layer of platinum to a temperature of about 1800-2000°F for a time of about 2 hours;

providing a source of aluminum in contact with the substrate surface, the source having an activity of about 40 to about 50 atomic percent as measured in a pure nickel foil; and simultaneously

heating the substrate surface and source of aluminum to a temperature of about 1925-2050°F for a time of from about 4 to about 16 hours.

17. The method of claim 16, including an additional step, after the step of heating the substrate surface and source of aluminum, of

depositing a ceramic layer overlying the substrate surface.

18. The method of claim 16, wherein the step of providing a substrate includes the step of

providing a nickel-base alloy substrate which is substantially a single crystal and has a composition that includes from about 5 to about 16 weight percent aluminum and from about 1 to about 8 weight percent rhenium.

19. An article prepared by the method of claim 16.

20. An article prepared by the method of claim 17.